Recovering from a Natural Disaster

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Future Problem Solving
Cashmere High School, August 2016

Questions

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- How do natural disasters affect places and people?
- How do places recover from natural disasters?
- What should be priorities for recovery?
- What are the impacts of different recovery policies?
- What future technologies might affect natural disasters and recovery?

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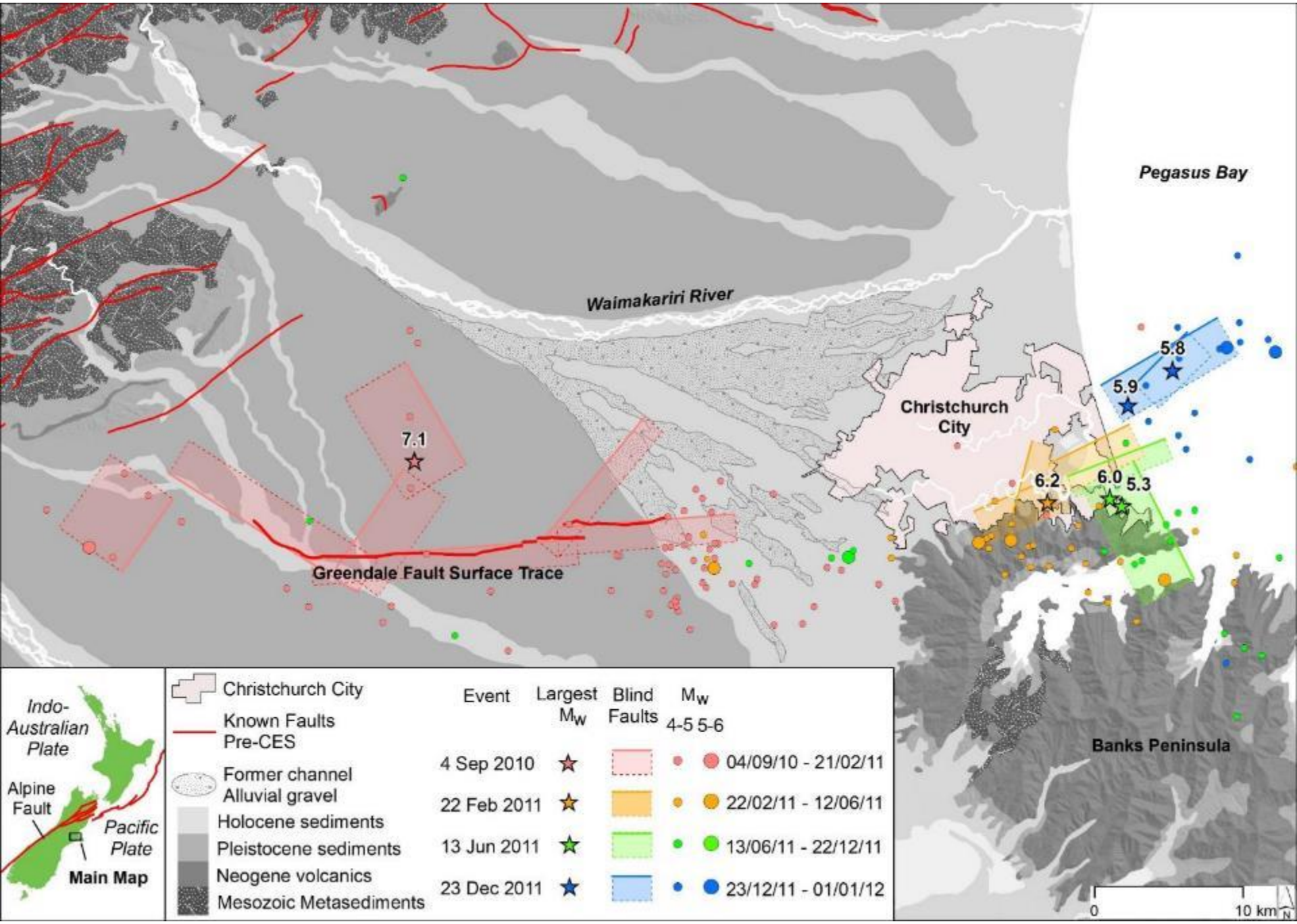
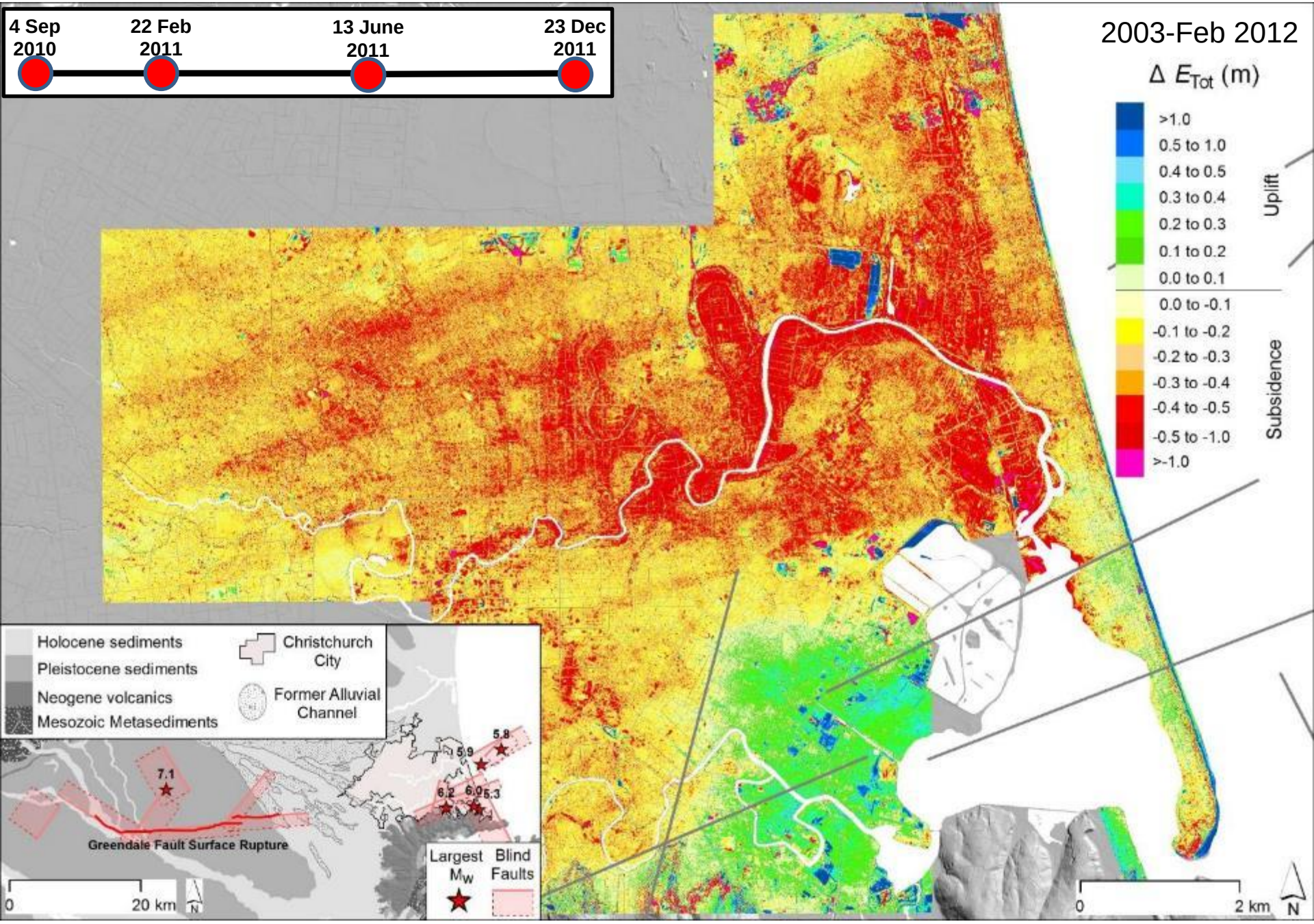
NATURAL DISASTER DAMAGE – WHERE?


Pegasus Bay
Waimakariri River
Christchurch City
7.1
5.8
5.9
6.2
6.0
5.3
Greendale Fault Surface Trace
Banks Peninsula
0
10 km
N
Indo-Australian Plate
Alpine Fault
Pacific Plate
Main Map
Christchurch City
Known Faults Pre-CES
Former channel Alluvial gravel
Holocene sediments
Pleistocene sediments
Neogene volcanics
Mesozoic Metasediments
Event
Largest Mw
Blind Faults
Mw 4-5 5-6
4 Sep 2010
22 Feb 2011
13 Jun 2011
23 Dec 2011
04/09/10 - 21/02/11
22/02/11 - 12/06/11
13/06/11 - 22/12/11
23/12/11 - 01/01/12

NATURAL DISASTER DAMAGE – PHYSICAL?


4 Sep 2010
22 Feb 2011
13 June 2011
23 Dec 2011
2003-Feb 2012
Δ E_{Tot} (m)
>1.0
0.5 to 1.0
0.4 to 0.5
0.3 to 0.4
0.2 to 0.3
0.1 to 0.2
0.0 to 0.1
0.0 to -0.1
-0.1 to -0.2
-0.2 to -0.3
-0.3 to -0.4
-0.4 to -0.5
-0.5 to -1.0
>-1.0
Uplift
Subsidence
Holocene sediments
Pleistocene sediments
Neogene volcanics
Mesozoic Metasediments
Christchurch City
Former Alluvial Channel
7.1
5.8
5.9
6.2
6.0
5.3
Greendale Fault Surface Rupture
Largest M_W
Blind Faults
0
20 km
N
0
2 km
N

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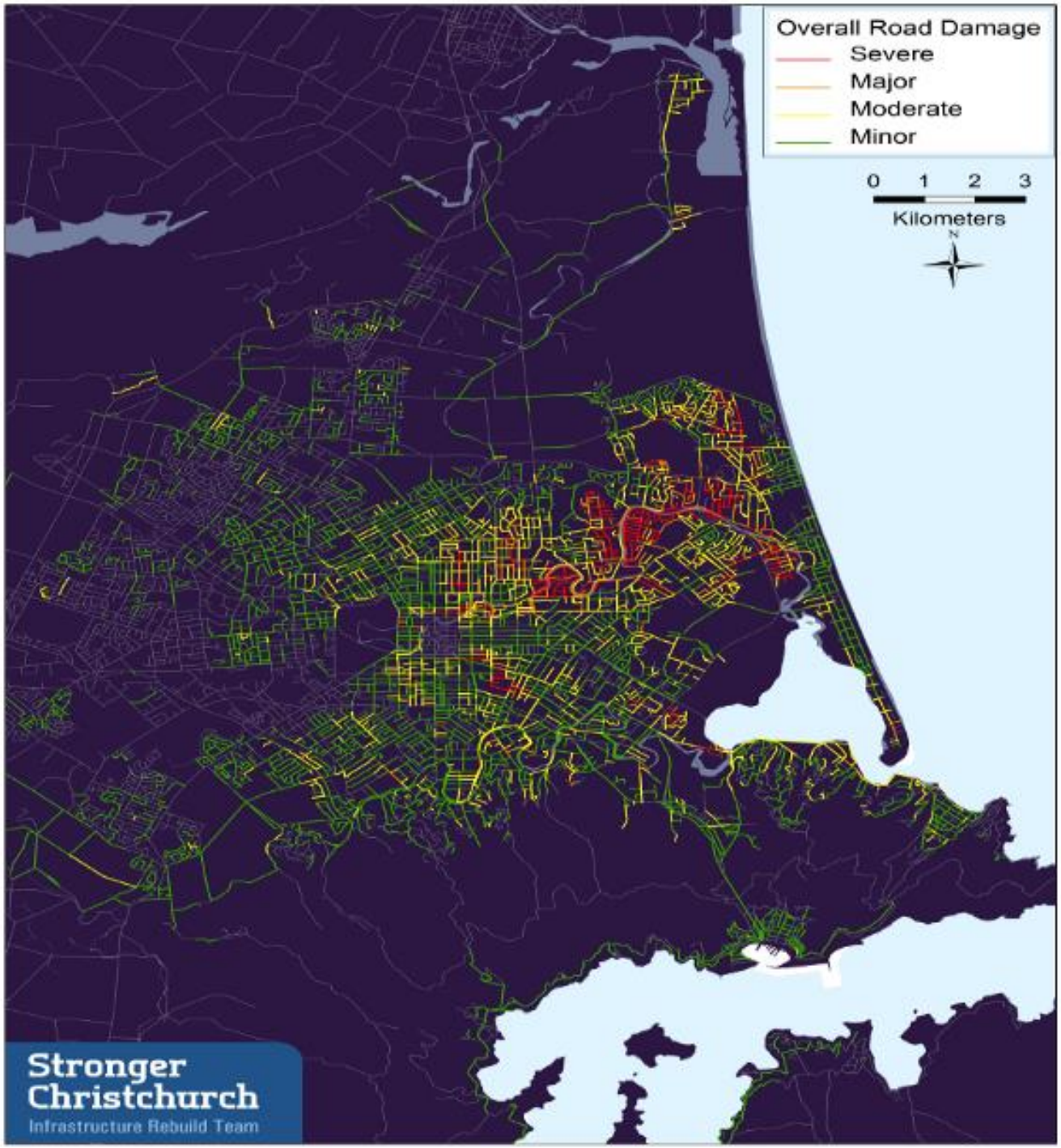
NATURAL DISASTER DAMAGE – COMMUNITY IMPACT?



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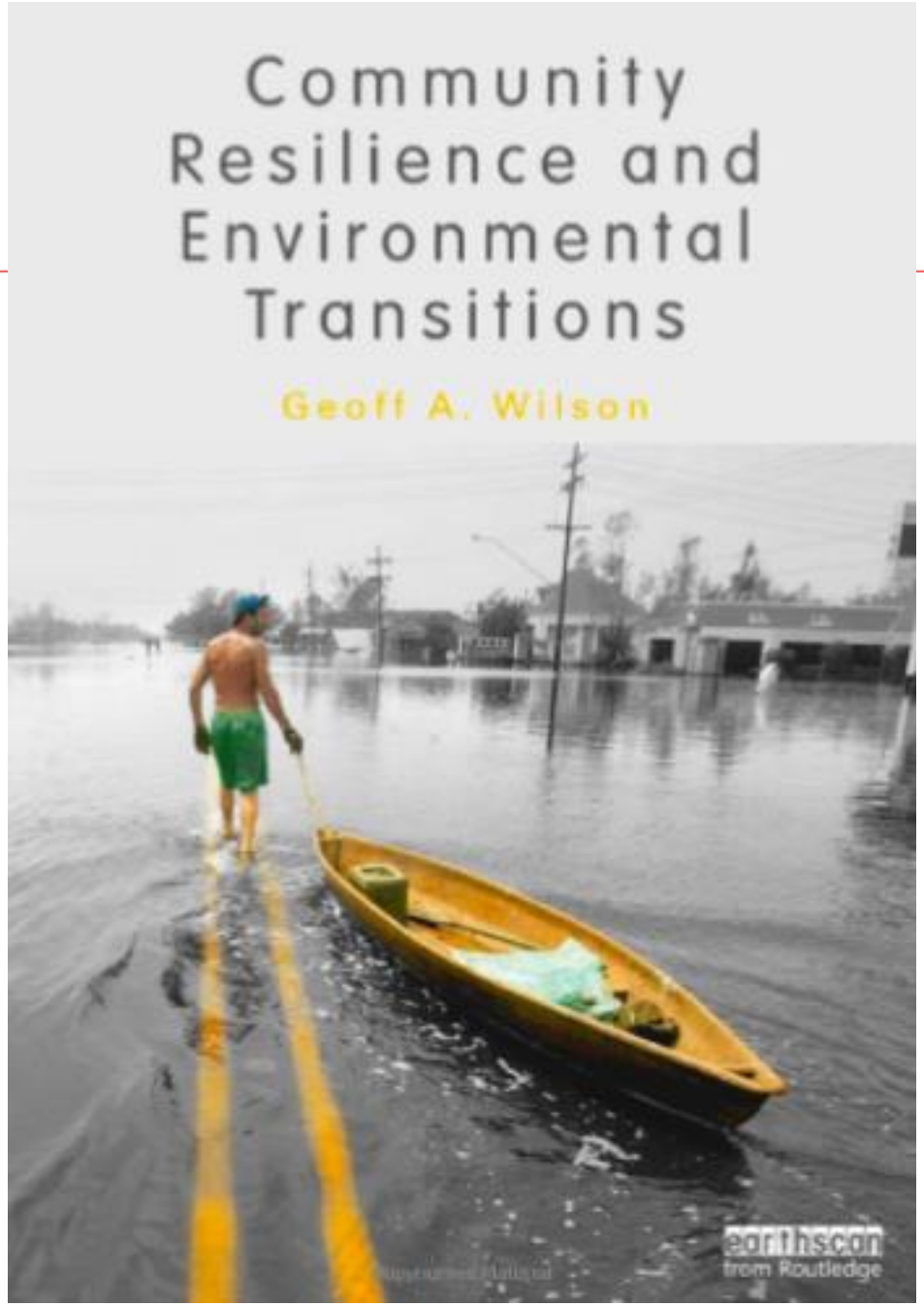
REDCLIFFS
SCHOOL
Through Challenge And Encouragement
Comes Success

WHAT IS RECOVERY?



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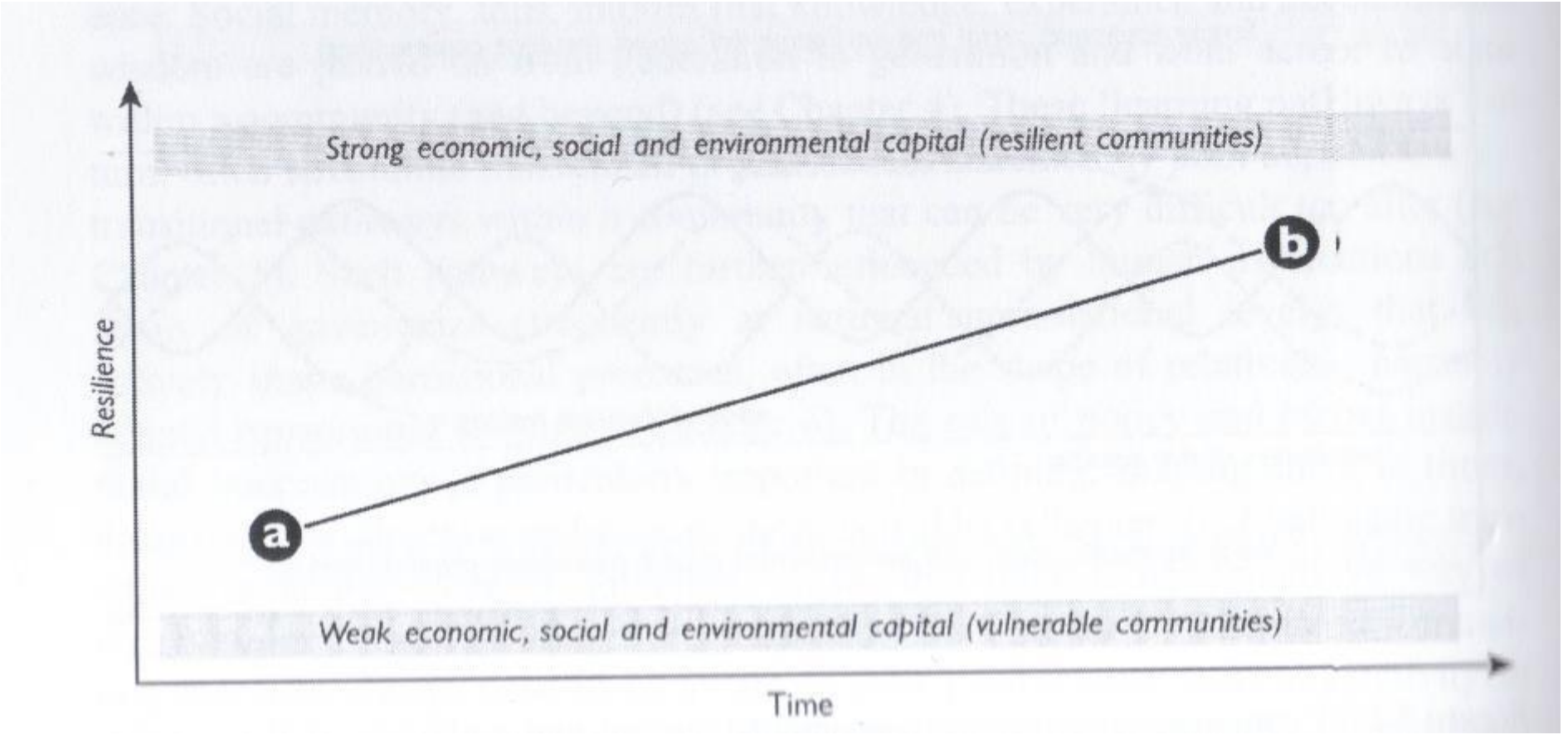
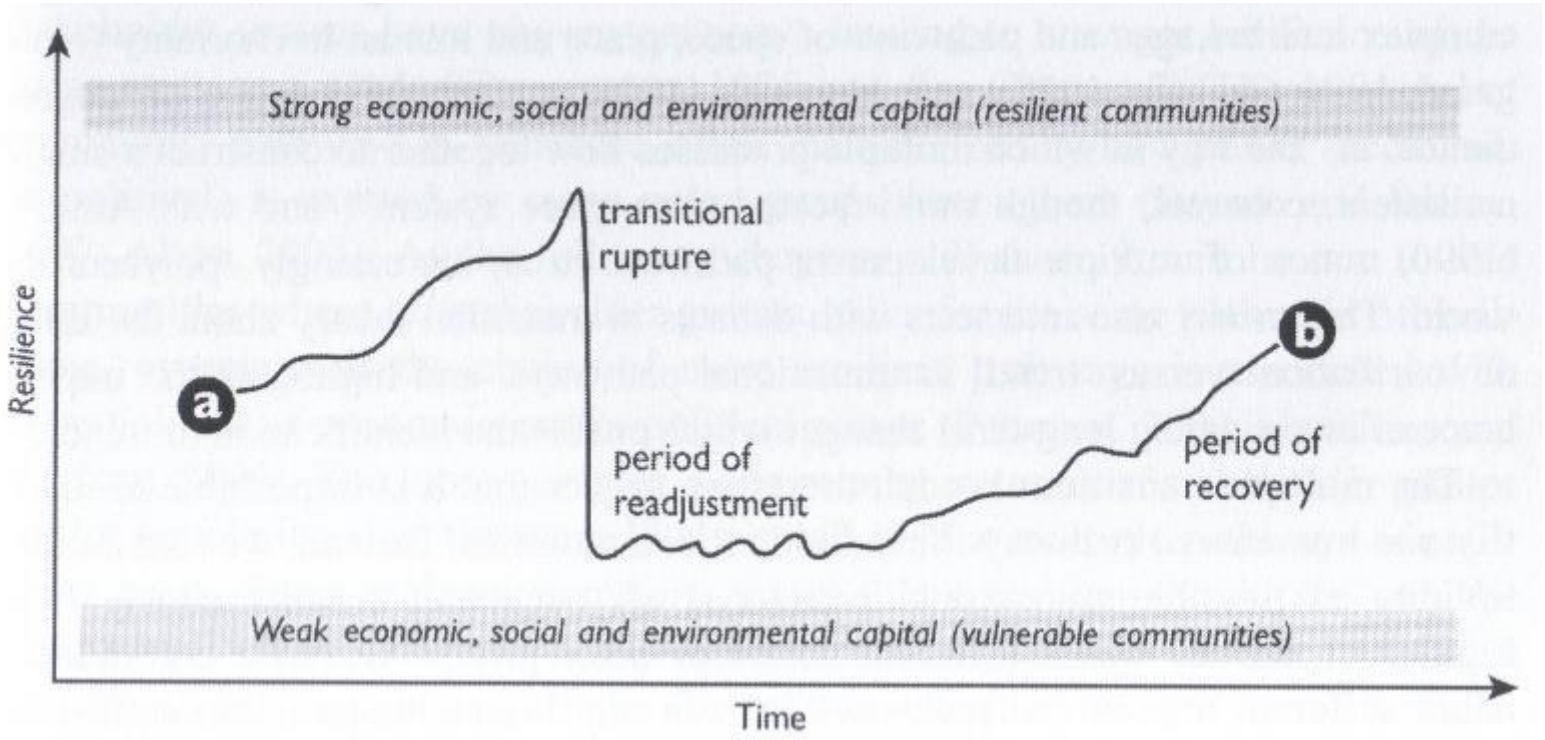
Linear transitions

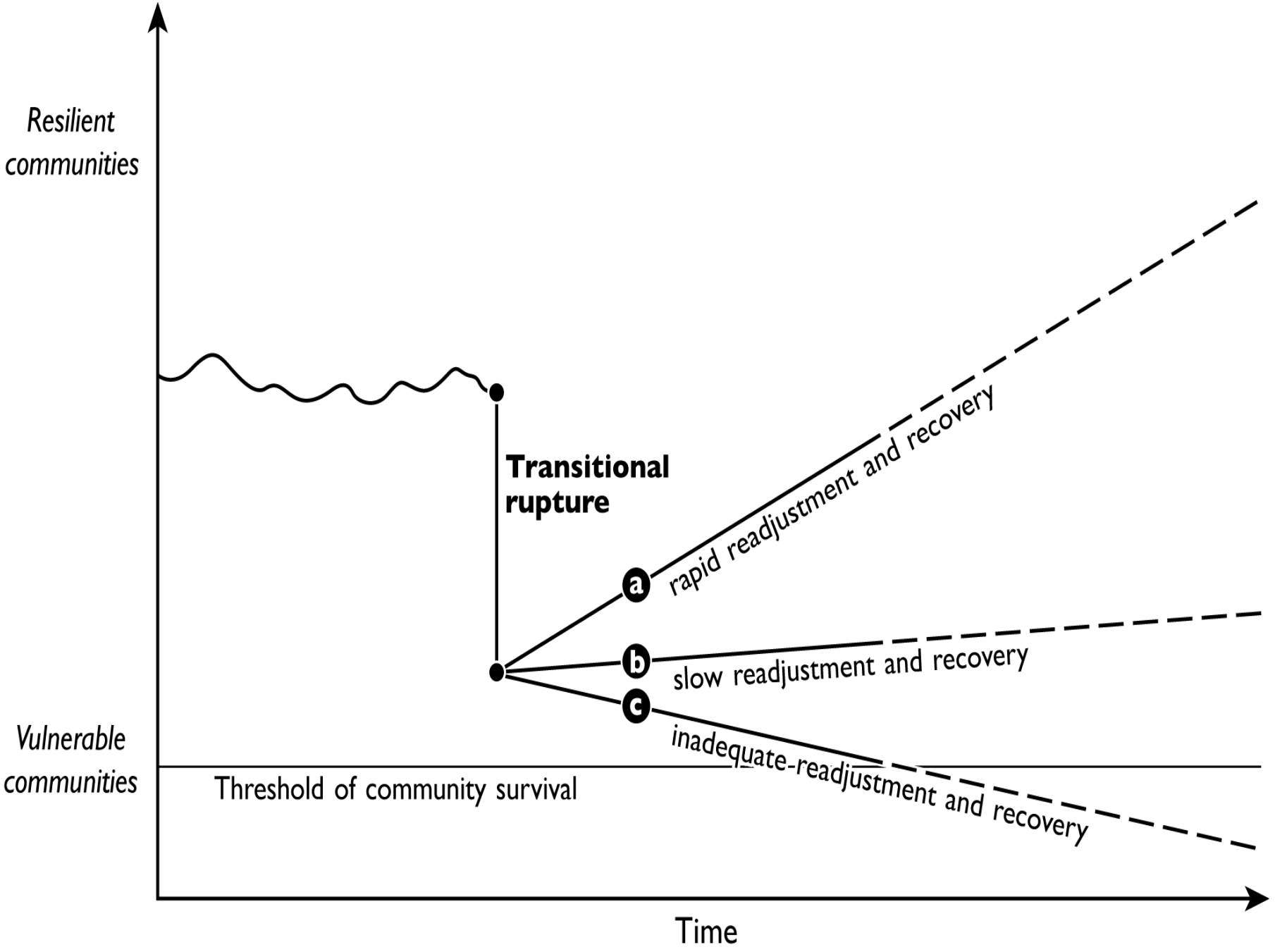


Source: Wilson, G.A. 2012: *Community resilience and environmental transitions*. London: Routledge

Disruption and recovery



Source: Wilson, G.A. 2012: *Community resilience and environmental transitions*. London: Routledge



Source: Wilson, G.A. 2012: *Community resilience and environmental transitions*. London: Routledge

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NATURAL DISASTER DAMAGE – HEALTH IMPACT?

Earthquakes and community

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- Facilities permanently or temporarily closed
  - schools, shops, GPs
- *Temporary* housing arrangements
  - Smaller housing, garages, even cars
  - Community break up & geographical challenges
- Dispersal/Relocation of whole communities
  - *Red zone* area not to be rebuilt
- Uncertainty over state of land and rebuild
  - Red, orange, green, white etc.

Earthquakes and health

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- Immediate health impacts
  - Injuries, fatalities
- Medium term impacts
  - Sanitation
  - Liquefaction dust
- Ongoing health impacts
  - Stress related

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NATURAL DISASTERS – WHAT DOES 'RECOVERY' MEAN?

Your places

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- Do this in groups or pairs
- Discuss each other's favourite urban place
- Be ready to tell us all about the other's place and why

Liveable places

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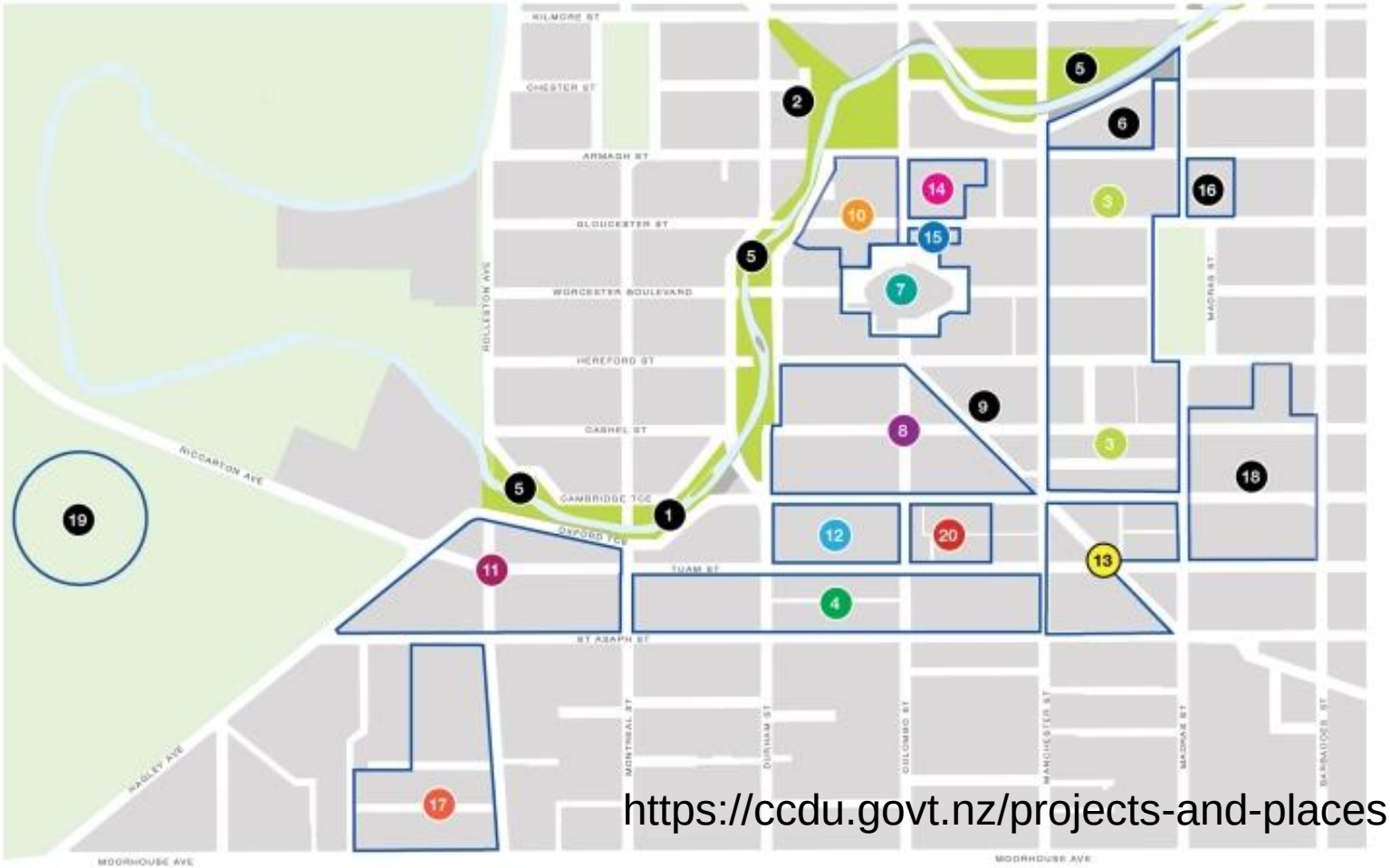
- What makes them liveable and likeable?

The anchor projects

Projects and Places

The Recovery Plan identifies the location of major anchor projects: key developments in Christchurch's central city. The anchor projects inspire confidence and give momentum to the inner city rebuild. Each project provides opportunities for individuals and organisations to be part of the city's future.

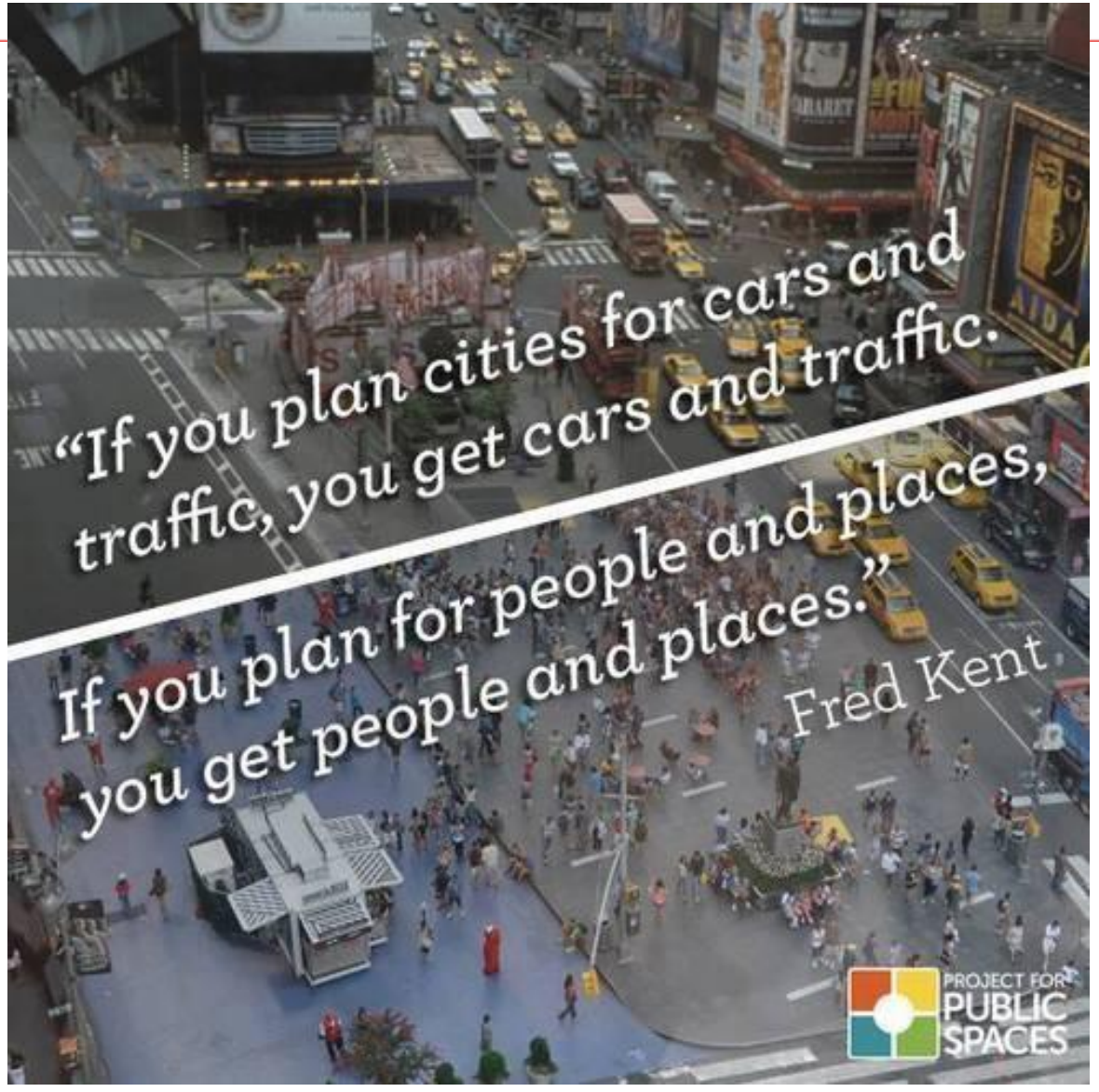


https://ccdu.govt.nz/projects-and-places

The anchor projects

https://ccdu.govt.nz/projects-and-places

Placemaking



Placemaking

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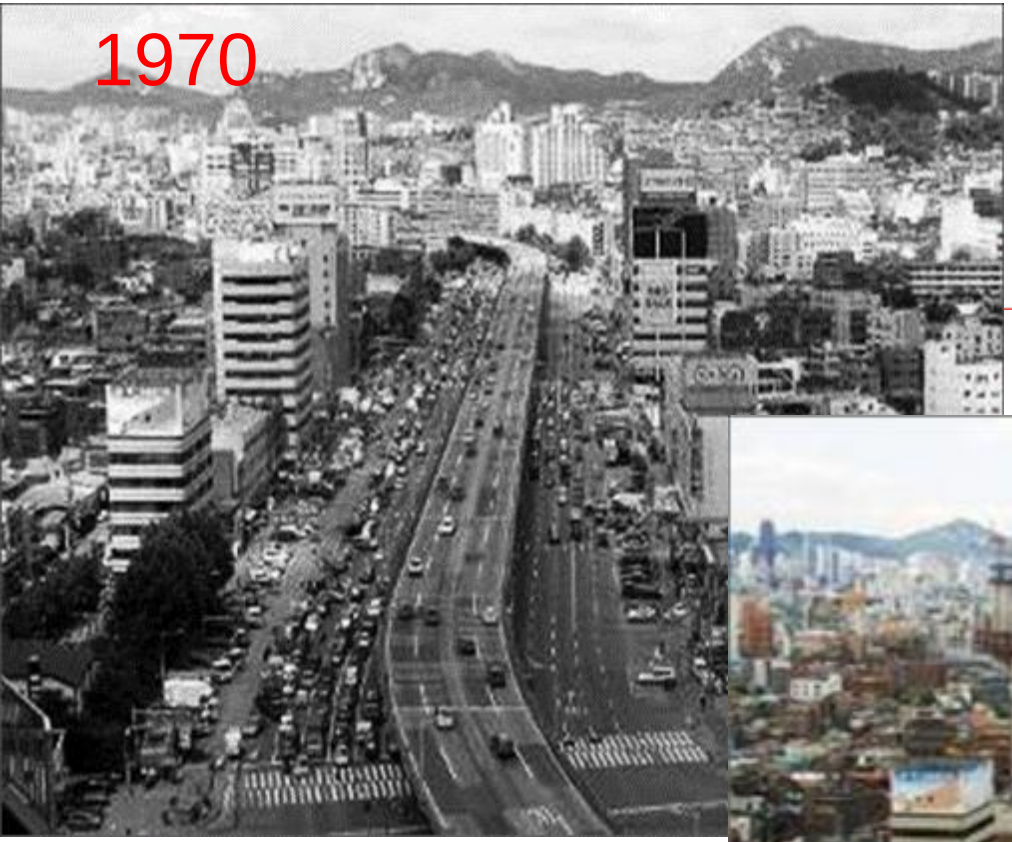

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http://www.kcet.org/socal/departures/landofsunshine/la-river/from-freeways-to-waterways-what-los-angeles-can-learn-from-seoul.html

Co-benefits

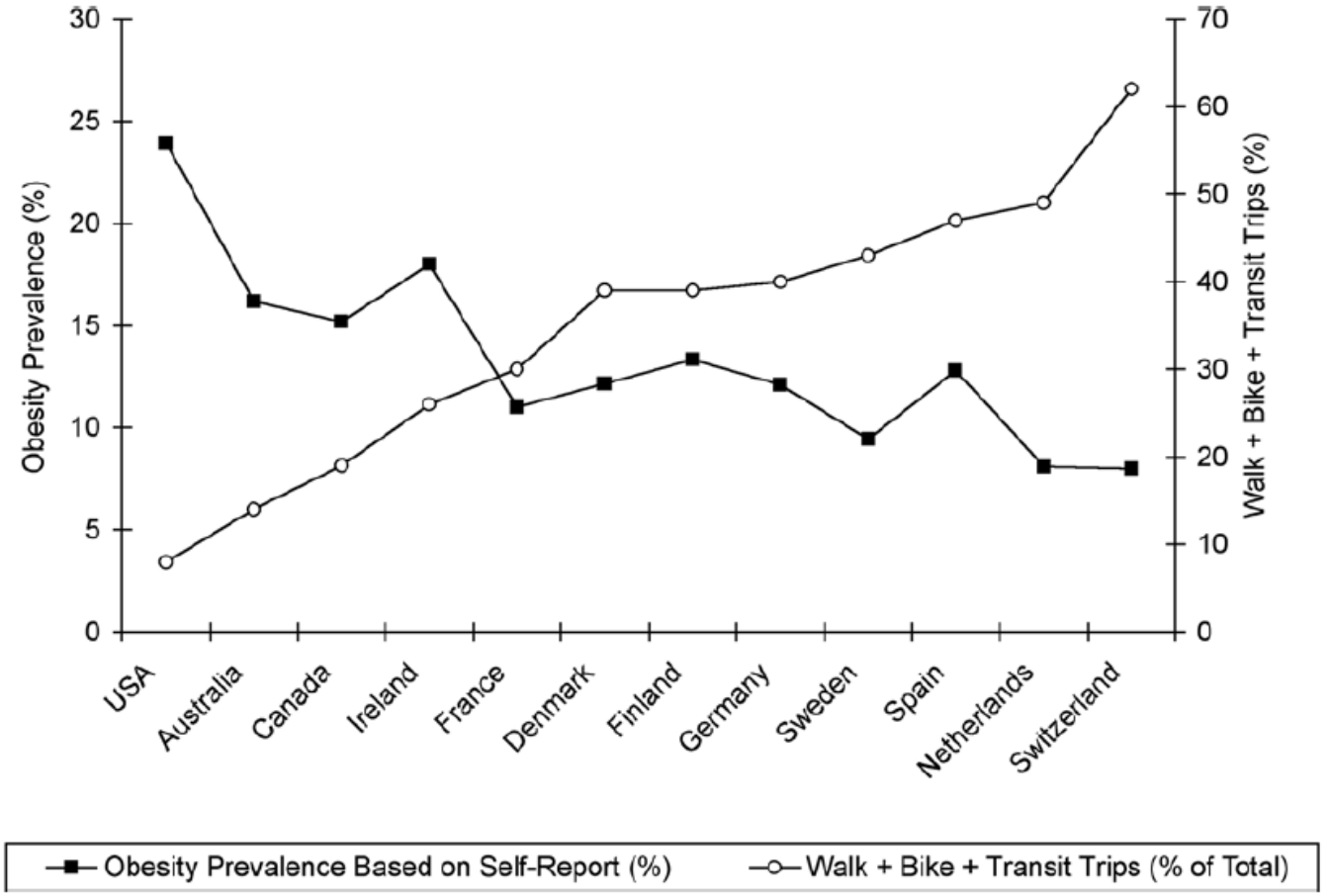

Figure 2 — Obesity (BMI ≥ 30 kg · m^{-2}) prevalence and rates of active transportation (defined as the combined percentage of trips taken by walking, bicycling, and public transit) in countries of Europe, North America, and Australia. BMI was computed from self-reported height and weight. Data were obtained from national surveys of travel behavior and health indicators conducted between 1994 and 2006 (see text for details).

Co-benefits

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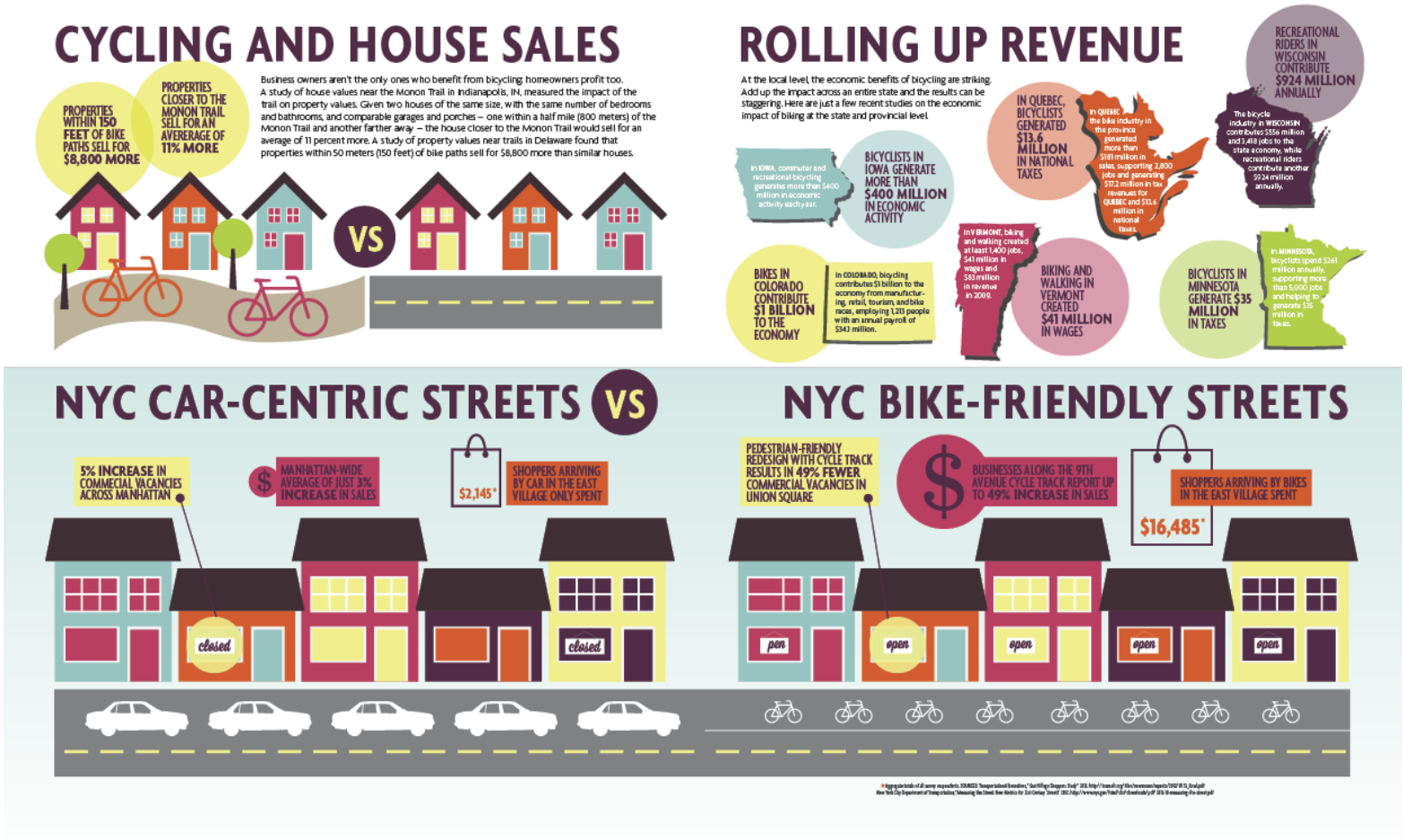

What we have learnt from the Christchurch earthquakes?

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- Aim
  - What can we learn from post-EQ Christchurch in terms of:
    - Building more resilient communities?
    - Role of built and social environment?
    - Community development?

Karen Banwell

Jesse Wiki

1. Residents surveys
2. Interviews with residents, leaders, stakeholders

Neighbourhood Connections

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LIGHT (< 150 vpd)

5.1 average connections

"We have great neighbours and live in a safe street"
"I enjoy talking with my neighbours"

MODERATE (500-2,500 vpd)

5.9 average connections

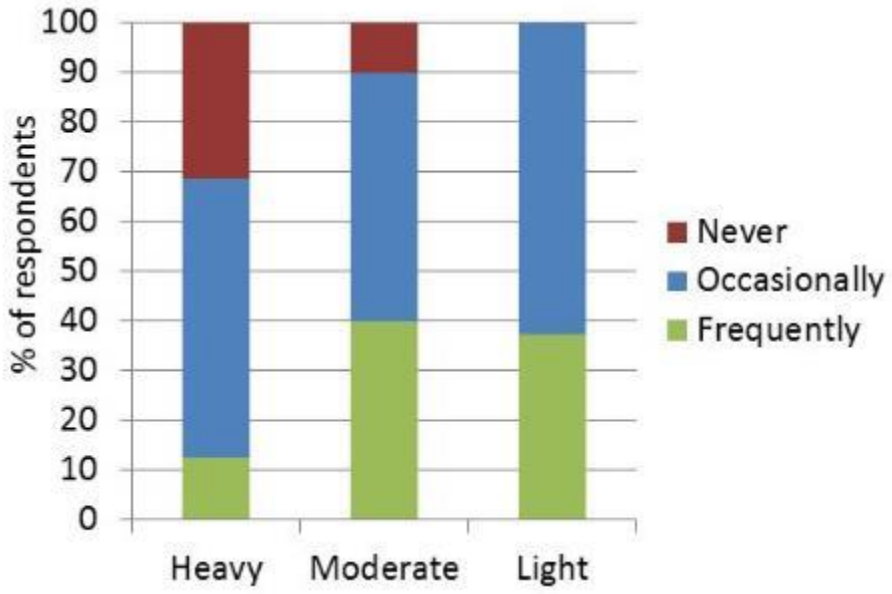
"Most people get out and about and talk on the street"
"Family-orientated and friendly"

HEAVY(8,400-14,000 vpd)

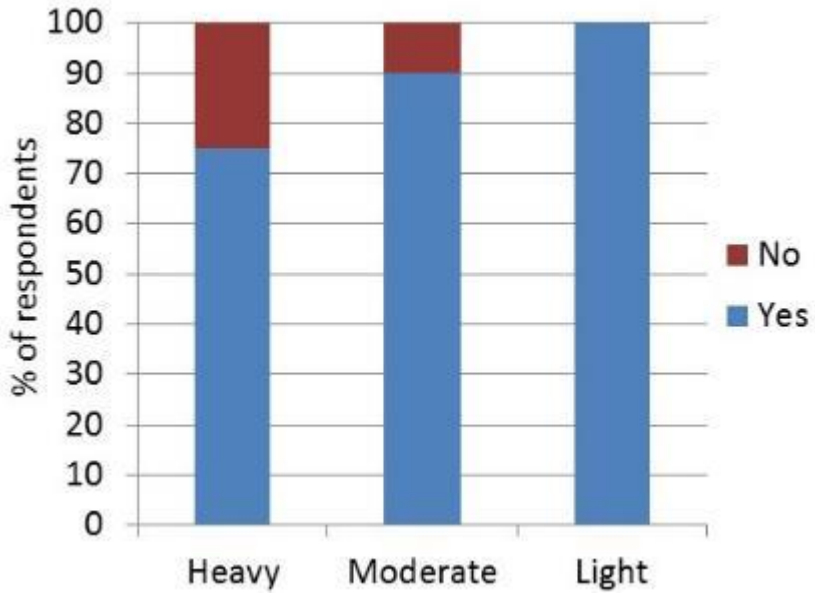
2.1 average connections

"My street is a car thoroughfare"
"Lived here over 35 years, a decline in people talking to neighbours and children playing"

Community and belonging



Community Interaction



Sense of Belonging

What we found: home & place?

- **Geographically defined** - hills, river, parks, social boundaries
  - *"Places like Sumner and Lyttelton got noticed because they are easy to know where they are, they have defined geography"*
- **Housing stability** – often renting vs owning, longevity of tenure
  - *"I have been renting for four years, and I don't give a shit about my neighbours where I am because we are temporary campers"*
- **Intimate streets** – cul-de-sacs, laneways, back sections
  - *"Our street is wide so we don't know each other"*
  - *"People get into their cars and go to work and then come home press the little button for their garage door and they go inside to their private spaces never once turning around"*
  - *"I just wonder how lonely some people are behind their private spaces"*

What we found: urban design?

- **Walkable** – safe, attractive and connected
  - *"Because walking somewhere you see people and that is really important to us to see people and have that eye contact and being human together"*
  - *"It can take a long time to get to the shops unlike the places with fences and garages"*
- **Local** - community hubs, library, pools, parks, recreation areas
  - "*If you have to get in your car it's not local*"
- **Bumping or gathering places** - schools, shops, churches, pubs, cafes
  - "*It's hard for people to engage with each other when you don't have a meeting place to come together*"
  - "*The school was the only bumping place for Phillipstown and then the Ministry closed it, the constancy in the children's lives. The Ministry did not see the school as a community hub or the importance for the community*"

What we found: initiatives?

- **Pre-existing community development initiatives/programmes** – govt or community, formal or informal
  - e.g. council, central government, NGOs, marae, churches, residents groups
  - *"Aranui really got together because they had that pre-existing community development stuff beforehand.*
  - *"I think a lot of it is about pre-existing community networks and community centre if there is an existing community hub and I think that is around schools too"*
  - *"Well I think it's all about going back to the response being enabled by strong community organisations pre-existing in an area. So if you want if you had a good church in that it was functioning connectedly then it would do that."*

Implications & policy responses

Streets

- Reduce traffic – encourage *social* modes
- Reduce traffic speed
- Better design new streets of 3,000+ vehicles (or retrofit existing)
  - e.g. back lanes, access lanes
  - e.g. alternative *bumping places*
    - Street furniture, bus stops, greenspace

Implications & policy responses

Places

- Focus more on public but also recognise need for private space
- Local access to amenity and social infrastructure
- Design *bumping places* (shared space) in new (and existing) urban developments
- Value community role of existing *gathering places* e.g. schools, churches

Mental health impacts

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Hypothesis

Christchurch residents more severely affected by the earthquakes and their impacts were more likely to show mood and anxiety symptoms when seeking care or treatment than less affected residents

Methods

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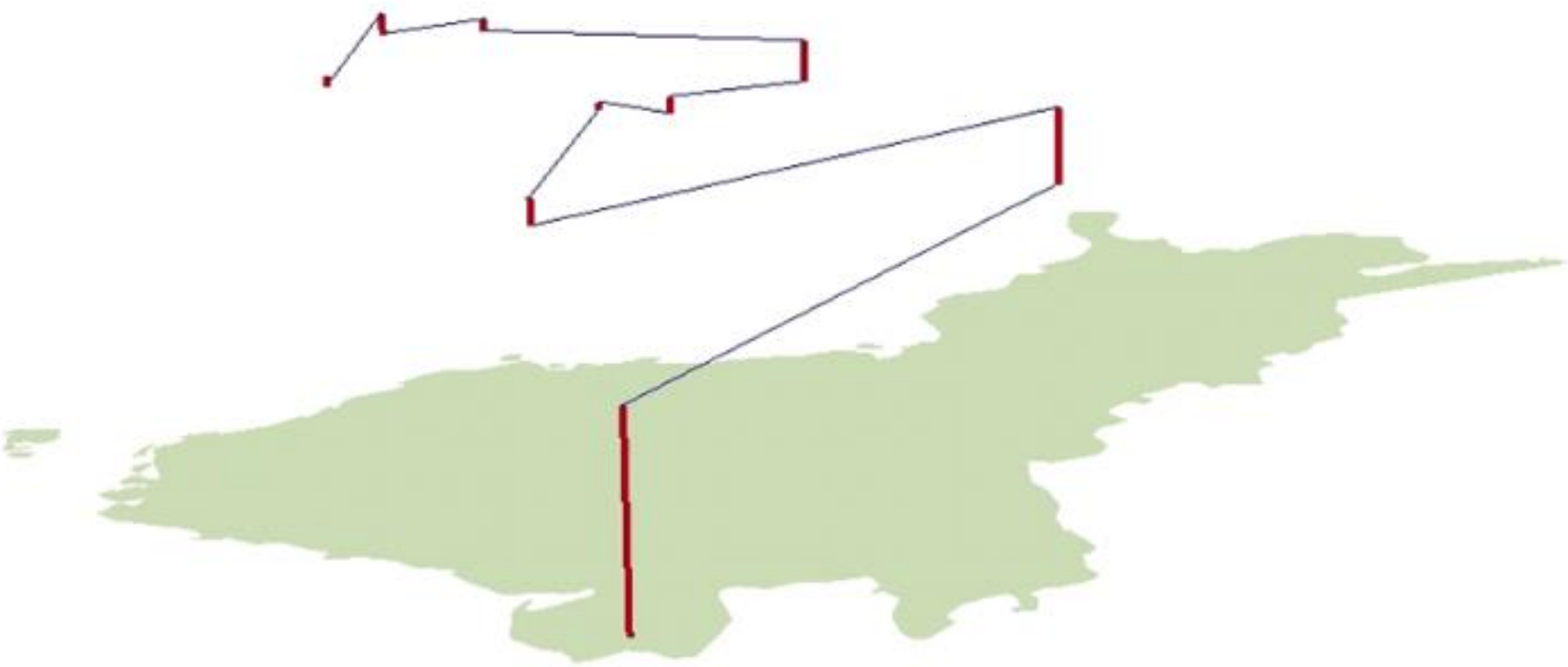
- Estimate *exposure* to seismic damage/impact
  - extent of home damage
  - infrastructure service closures and restriction
  - community disruption e.g. school & shop closure
  - amount & extent of liquefaction
  - magnitude of *shaking*
  - changing land zone *colour*

Methods

- Tracking where people lived from treatment back to where they lived on day of earthquake



Results

Christchurch vs. non-Christchurch comparison

Significant greater increases in risks among Christchurch residents:

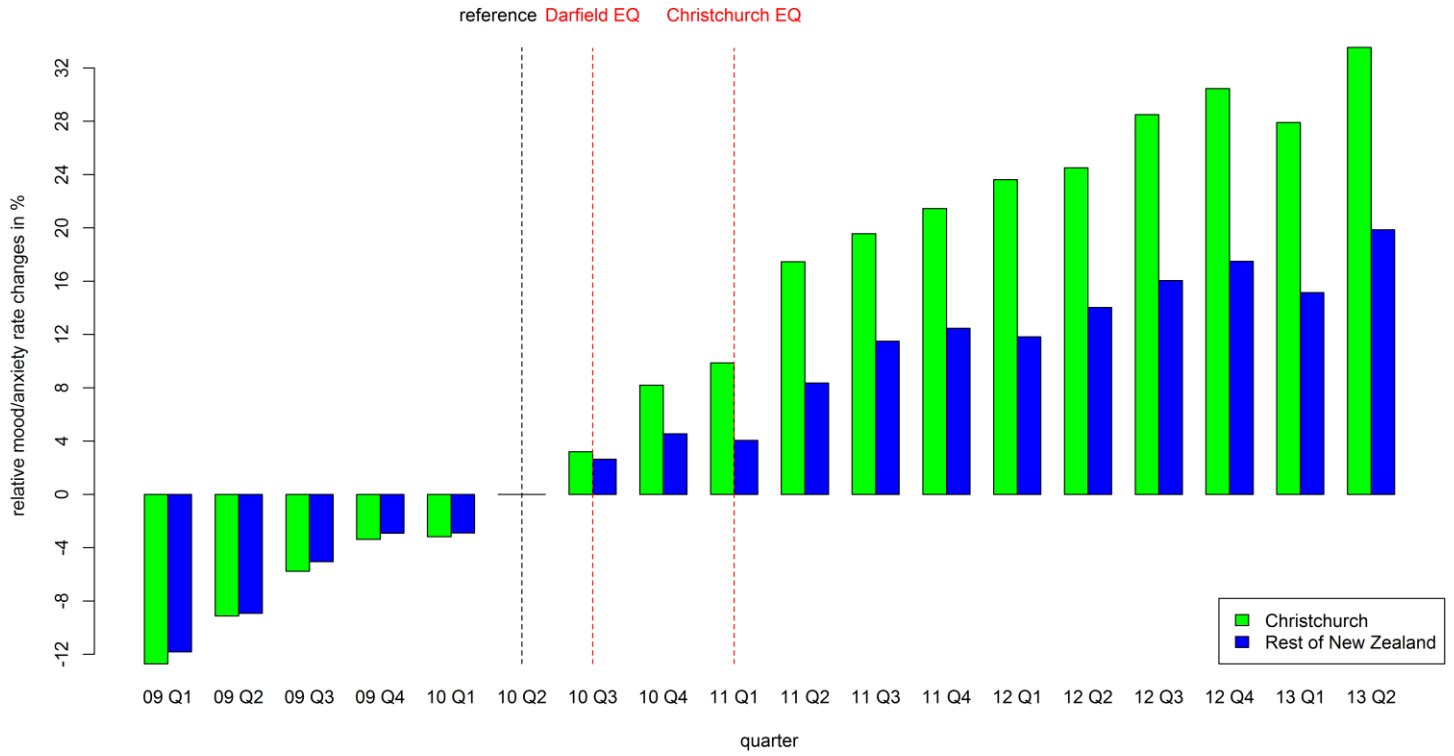
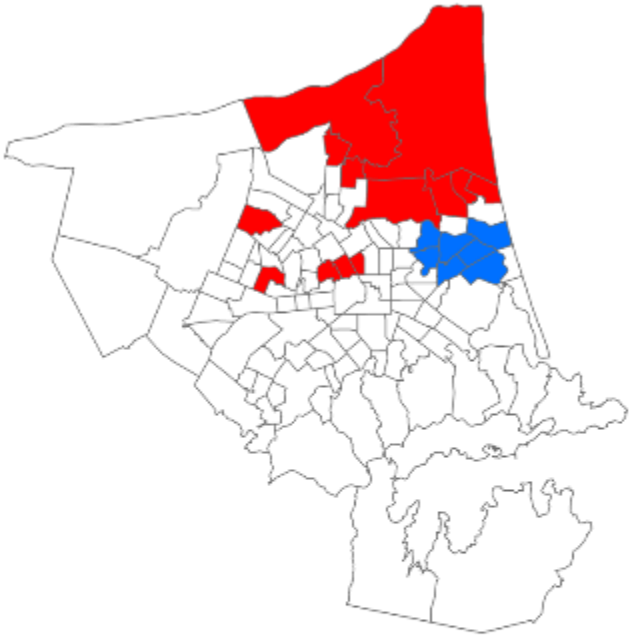
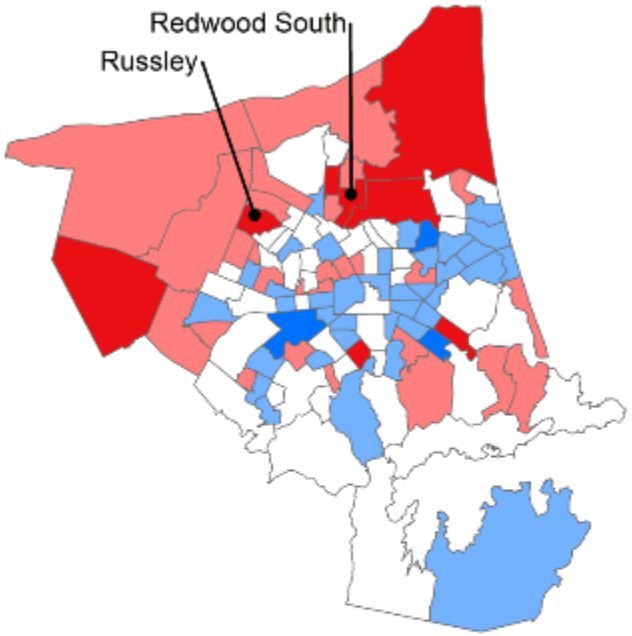


Figure 6: Quarterly relative mood/anxiety rate changes among Christchurch/non-Christchurch residents compared to 10Q2

Detect unusual MA treatment changes over time





Legend

Core hot- and coldspots based on reliability

- Not reliable (R <= 0.5)
- Hotspot (R > 0.5)
- Coldspot (R > 0.5)

10 5 0 10 Kilometers

Legend

Standard deviations of relative risk changes over time

- < -1.5 Std. Dev.
- -1.5 - -0.50 Std. Dev.
- -0.50 - 0.50 Std. Dev.
- 0.50 - 1.5 Std. Dev.
- > 1.5 Std. Dev.

N W E S

Figure 9: Areas with strong increase (hotspot) and small increase or decrease (coldspot) of MA treatment rates based on SaTScan™ spatial variation in temporal trends analysis (left), as well as Bayesian spatio-temporal modelling (right)(labelled areas exhibit statistically significant changes)

Main results

- More mental health treatments after the earthquakes compared to rest of NZ
- Women, children, elderly and those with pre-existing mental illnesses at higher risk
- Mobility is a risk factor – e.g. permanent relocatees + short-term returners
- Mental health policy should focus on socially vulnerable groups, long-term relocatees, short-term returners

Future technologies

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Land Information New Zealand
Toitū te whenua

'The power of where' drives New Zealand's success

Land Information New Zealand (LINZ) makes a significant contribution to the smooth running and development of New Zealand.

So many decisions involve information about location– from finding the best use for farmland, to deciding where to build a school, to planning underground infrastructure maintenance, to deciding which route to take to work. This is information that LINZ provides.

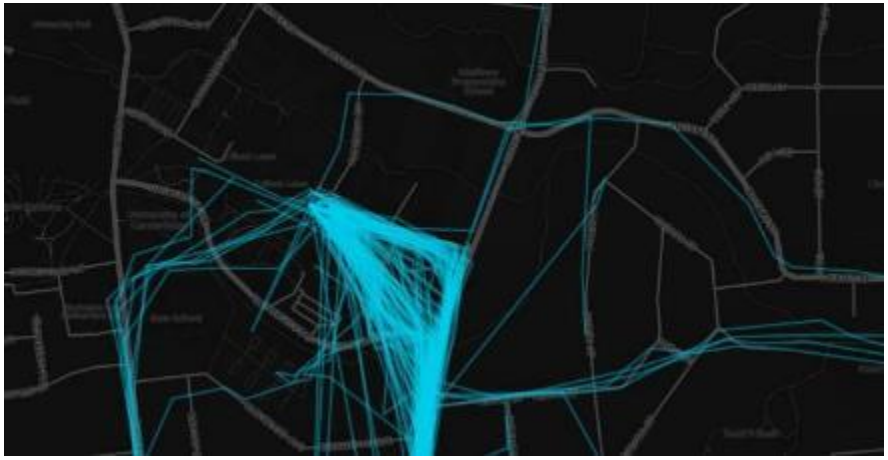
Decisions using location information already add $1.2 billion to New Zealand's economy. LINZ's vision is to increase this value by tenfold over the next decade. We call this 'the power of where'.

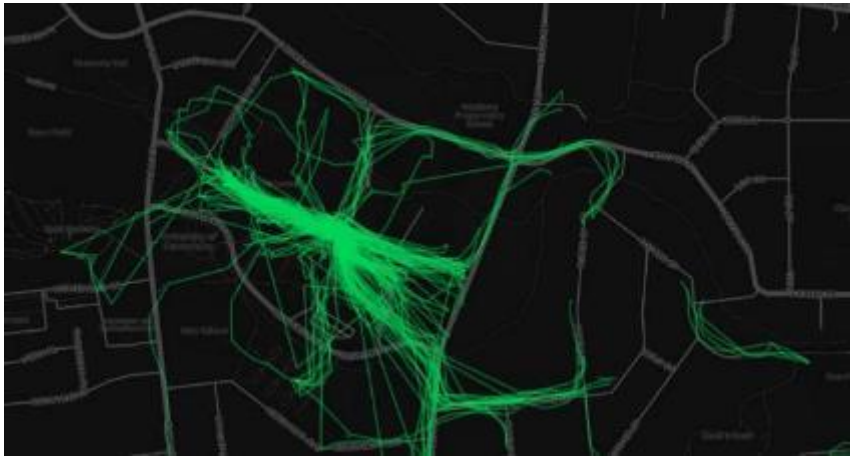
Future technologies

Orange = Motor vehicle

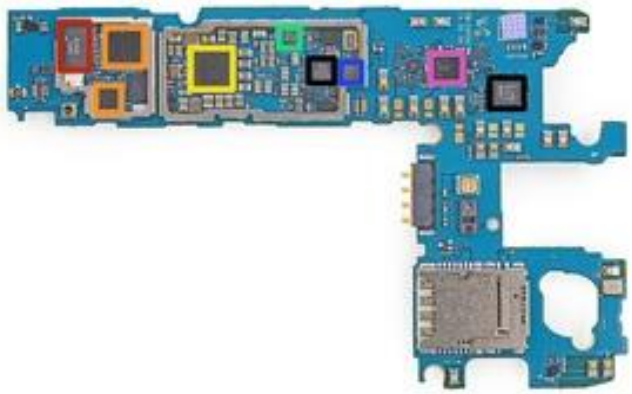
Blue = Cycle

Green = Walk





Future technologies



Future technologies

25% of Dubai's buildings will be 3D printed by 2030: Mohammed

'Future will depend on 3D printing technologies in all aspects of our life, starting from houses we live in, the streets we use, the cars we drive, the clothes we wear and the food we eat'

By Wam

Published Wednesday, April 27, 2016

Future technologies

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